

2056
B.E. (Computer Science and Engineering)
Sixth Semester
Elective - I

CS-605A: Software Testing and Quality Assurance

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.

x-x-x

Q1. Answer the following short-answer questions:-

- a) Define Software Quality Assurance (SQA). How does it differ from Software Testing?
 - b) What is a Baseline in Software Configuration Management?
 - c) List any two differences between Verification and Validation.
 - d) What is Cyclomatic Complexity? Give its formula.
 - e) Define Boundary Value Analysis. Give one example with two test cases for input range [1, 100].
 - f) What is a Fault Tree Analysis? Name the type of testing it is associated with.
 - g) State the purpose of ISO 9001:2000 in software quality standards.
 - h) What is the difference between Alpha Testing and Beta Testing?
 - i) Define Risk Projection. What two factors are estimated in it?
 - j) What is Equivalence Partitioning? Give one example showing at least two equivalence classes.
- (10x1)

Section - A

Q2.

- a) Explain the concept of Capability Maturity Model (CMM). Describe all five maturity levels with their characteristics and the key process areas associated with each level.
 - b) Differentiate between ISO 9000, ISO 9001:2000, and ISO 9126. Which standard focuses on software product quality characteristics and why? Also list any four quality factors defined under ISO 9126.
 - c) What are Formal Technical Reviews (FTRs)? State any four review guidelines that make an FTR effective. How does FTR contribute to software reliability?
- (5,3,2)

Q3.

- a) What is Six Sigma in the context of software quality? Explain the DMAIC process with a brief example of how it can be applied to reduce defects in software development.
 - b) Explain TQM (Total Quality Management) and SPICE (Software Process Improvement and Capability Determination). How does SPICE complement CMM?
 - c) A software project has been assessed to have the following defect data over 5 inspections: Inspections: 5, Defects Found: 40, Defects Removed before Testing: 30. (i) Calculate the Defect Removal Efficiency (DRE). (ii) If total defects in the product are estimated as 50, what is the number of latent defects?
- (4,3,3)

Q4.

- a) Explain the RMMM (Risk Mitigation, Monitoring, and Management) Plan. How does it help in proactive software risk management? Include the steps of Risk Identification, Risk Projection, and Risk Refinement in your answer.
- b) What is Software Configuration Management (SCM)? Explain the following SCM activities with examples: (i) Version Control, (ii) Change Control, (iii) Configuration Audit.

Contd.....P/2

(2)

- c) A software project has the following risk table: Risk A: Probability = 0.40, Cost Impact = ₹1,00,000 Risk B: Probability = 0.25, Cost Impact = ₹2,40,000 Risk C: Probability = 0.15, Cost Impact = ₹80,000 Calculate the Risk Exposure (RE) for each risk and identify the highest-priority risk. Also calculate total RE. (5,3,2)

Section - B

Q5.

- a) Differentiate between Black-Box Testing and White-Box Testing. Explain any three Black-Box testing techniques with suitable examples.
- b) Explain the following types of testing with their objectives and when they are performed:
(i) Integration Testing (ii) System Testing (iii) Recovery Testing (iv) Performance Testing.
- c) A software module has the following data after testing: Total Lines of Code (LOC): 2,000 Errors Found: 25 Errors Corrected: 20 Test Cases Executed: 100 Defects Found: 15 (i) Compute Defect Density. (ii) Compute Test Effectiveness Ratio (TER). (iii) What does a high defect density indicate for software quality? (4,4,2)

Q6.

- a) What is Basis Path Testing? Explain with an example how to: (i) Draw a flow graph for a given program segment, (ii) Calculate Cyclomatic Complexity using all three methods, (iii) Identify the independent paths. Use the following program segment:
if (A > 0) { if (B > 0) { X = A + B; } else { X = A - B; } } else { X = 0; }
- b) Explain Data Flow Testing and Loop Testing with examples. How do they complement path-based testing techniques?
- c) For the following decision table, identify the valid test cases using Equivalence Partitioning and Boundary Value Analysis for the function: "A student passes if marks ≥ 50 AND attendance $\geq 75\%$." Input ranges: Marks: [0-100], Attendance: [0-100]% Identify: (i) Equivalence classes for both inputs, (ii) Boundary values for both, (iii) At least 4 test cases. (5,3,2)

Q7.

- a) Explain the Test Plan Development process. What are the key components of a Test Plan document? Also describe the phases of testing: Requirement Phase, Design Phase, and Program Phase Testing.
- b) Explain the challenges and strategies involved in the following specialized testing scenarios: (i) Testing Web-based Systems (ii) Testing Real-Time Systems (iii) Testing Client/Server Systems.
- c) A software project undergoes debugging with the following data: Total Bugs Reported: 80 Bugs Fixed in Same Day: 30 Bugs Fixed in 2-5 Days: 35 Bugs Fixed after 5 Days: 15 (i) Compute the Bug Fix Rate for each category. (ii) What is the percentage of bugs taking more than 5 days to fix? (iii) Suggest one debugging strategy that would reduce the "after 5 days" category. (4,3,3)